UNITED STATES PATENT AND TRADEMARK OFFICE

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EXAMINER
CHU, DAVID H

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 May 2008*.
2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6 and 8-15* is/are pending in the application.
    4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-6 and 8-15* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    a)☒ All   b)☐ Some * c)☐ None of:
      1.☒ Certified copies of the priority documents have been received.
      2.☐ Certified copies of the priority documents have been received in Application No. _____.
      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.
4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

Claim Objections

1.	Objection to claim 4 is withdrawn in light of the Applicant's amendment

Claim Rejections - 35 USC § 112

2.	The rejection to claims 7-10 are withdrawn in light of the Applicant's amendment

3.	The rejection to claims 9 and 10 are withdrawn in light of the Applicant's amendment

Claim Rejections - 35 USC § 101

4.	The rejection to claim 11 is withdrawn in light of the Applicant's amendment

Claim Rejections - 35 USC § 102

5.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6.   Claims 1-6, 11-15 are rejected under 35 U.S.C. 102(b) as being anticipated

by Shen et al. ("Differential Volume Rendering: A Fast Volume Visualization

Technique for Flow Animation").

7.   Note with respect to claim 1,

Shen et al. teaches:

- a) Determining relevant first volume values of a first volume image, which are

    relevant to visualization of the first volume image, from volume values of said

    first volume image

    [Shen et al. teaches an efficient volume rendering method by utilizing a differential file

    ("relevant volume values") that that contains the data paths of only the changed elements.

    The differential file contains 3D positions ("volume values") and values of the changed data

    elements at each time step (each time step comprise of the "first and second volume

    image"). The data from the differential file used in rendering the first image, is the equivalent

    to a "first volume value relevant to visualization of a first volume image"]

    (Shen et al., pg. 181-182: "Differential Volume Rendering" "Visualization Pipeline")

- b) Storing first voxels with which the relevant first volume values are associated

  [Refer to above. The voxel is the "associated volume value"]

- c) Deriving a first two-dimensional image from the stored first voxels of the first volume image

  [As discussed above, Shen et al. teaches differential volume rendering (2D projection of a 3D discretely sampled data set)]

- d) Determining relevant second volume values of a second volume image, which are relevant to visualization of the second volume image, from second volume values which are associated with the stored first voxels or with voxels neighboring said stored first voxels

  [As discussed above, Shen et al. teaches using only the information needed ("determined relevant volume values") for the rendering process, wherein the volume data at each time step can be discarded (volume data ("stored voxels") other than those of the differential file need only to be used once). Note further, Shen et al. teaches a Discrete Rays and Zero-Order Interpolation method as one of the many interpolation and ray sampling methods used for the ray casting algorithm, wherein 4 surrounding pixels ("neighboring voxels") are selected to cast new rays]

  (Shen et al., pg. 182-183: "Pixel Positions Calculation")

- e) Storing second voxels with which the relevant second volume values are associated

  [Refer to above.]

- f) Deriving a second two-dimensional image from the stored second voxels of
  the second volume image

  [Refer to above. Volume rendering is a step of creating 2D images of a 3D object]

8.   <u>Note with respect to claim 2</u>,

Shen et al. teaches:

A method as claimed in claim 1, in which,

- The neighboring voxels are defined by a motion model of the moving object
  motion

  *[As discussed above the ray casting method are able to cast rays along a path (one of the
  methods being defined by 4 surrounding voxels) corresponding only to changed data
  elements. Such tracking (generating a the differential file discussed above) of only the
  changed data elements defines a "motion model" of the change in object ("object
  motion"). Shen et al. teaches efficient volumetric rendering of a sequence of 3D volumetric
  simulation data such as flow dynamics ("moving object")]*

9.   <u>Note with respect to claim 3</u>,

Shen et al. teaches:

A method as claimed in claim 1, in which,

- All voxels from regions surrounding the stored first voxels are defined as
  neighboring voxels

[The voxels that fall within the range onto which the rays is cast, out of the different interpolation and ray sampling methods taught by Shen et al., defines the range of the "surrounding/neighboring voxels" vary]

10.   <u>Note with respect to claim 4,</u>

Shen et al. teaches:

A method as claimed in claim 1, in which,

- At least on of a shape and a magnitude of the surrounding regions is adjustable

  [Depending on the interpolation and ray sampling methods taught by Shen et al., the area range through which the ray is cast varies]

11.   <u>Note with respect to claim 5,</u>

Shen et al. teaches:

A method as claimed in claim 3, in which,

- A surrounding region comprises all voxels positioned no further than a given geometrical distance from a first voxel

  [The threshold defined by the different interpolation and ray sampling methods taught by Shen et al. defines the "geometrical distance from a first voxel" (changing point of stored in the differential file discussed above)]

12.   <u>Note with respect to claim 6</u>,

Shen et al. teaches:

A method as claimed in claim 1, in which,

- The first voxels of the first volume image are combined in blocks for storage,

  each block being stored when a first volume value associated with at least

  one first voxel in the block is relevant for the visualization of the first volume

  image, the visualization of the second volume image being derived from the

  second volume values which are associated with the first voxels in the stored

  blocks or in blocks neighboring the stored blocks

  [The only information need for the rendering process (points stored in the differential file)

  discussed above, is the "blocks for storage" that is utilized in the visualization of the all

  volume data]

13.   <u>Note with respect to claim 12</u>,

Shen et al. teaches:

The method as claimed in claim 1, further comprising the steps of:

- Repeating the steps of d) to f) to derive further two-dimensional images from

  subsequent volume images

  [Shen et al. teaches that the volume rendering process consist of a series of volume

  rendered images at different time steps]

  (Shen et al., pg. 181, line 3-16: "Introduction")

14.   Note with respect to claim 13,

Shen et al. teaches:

The method as claimed in claim 1, wherein,

- Determining the relevant first volume values of the first volume image, which

  are relevant for the visualization of the first volume image, is based on an

  imaging direction

  [The simulation direction of Shen et al. is the "imaging direction"]

15.   Note with respect to claims 11 and 14, claims 11 and 14 is similar in scope to the

claim 1, thus the rejections to claim 1 hereinabove are also applicable to claims 11 and

14.

Note further, Shen et al. teaches a single processor workstation ("computer")

(Shen et al., abstract)

16.   Note with respect to claim 15,

Shen et al. teaches:

- A monitor for consecutively displaying the firs two dimensional image and the

  second two-dimensional image

  [Shen et al. teaches volume animation ("consecutively displaying") of 3D flow. Further,

  Shen et al. teaches a workstation that inherent comprise of a monitor for display]

  (Shen et al., pg. 181, "Differential Volume Rendering")

Claim Rejections - 35 USC § 103

17.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

18.   Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Shen et al. as applied to claims 1-6 and 11-15 above, and further in view of

Brandl et al. (U.S. Patent No. 6450962).

19.   <u>Note with respect to claims 8 and 9</u>,

Brandl et al. teaches:

▪   An ultrasound apparatus and the acquisition unit comprises a sonography

applicator

(Brandl et al., col. 5, line 42-51)

Therefore, at the time of the invention, it would have been obvious to one of an ordinary skill in the art to use the sonography teaching of Brandl et al. to acquire the image data, because sonography is a well known method in the art as supported by reference Brandl et al., and such combination of teachings yield predictable results.

20.   Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Shen et al. as applied to claims 1-6 and 11-15 above, and further in view of Goto

(PGPUB Document No. US 2004/0075658).

21.   <u>Note with respect to claim 10</u>,

Goto teaches:

 The apparatus as claimed in claim 8, wherein,

- The apparatus is a CT apparatus and the acquisition unit comprises an X-ray

  source and an X-ray detector

  [Goto, 0021]

Therefore, at the time of the invention, it would have been obvious to one of an

ordinary skill in the art to use the X-ray teaching of Goto to acquire the image data,

because sonography is a well known method in the art as supported by reference

Brandl et al., and such combination of teachings yield predictable results.

Response to Arguments

22.   Applicant's arguments filed 5/28/2008 have been fully considered but they are not persuasive.

Following are the Applicant's arguments in bullets and examiner's response in brackets.

23.   The Applicant argues:

- Shen et al. does not disclose determining relevant first volume values of a first volume image, which are relevant to visualization of the first volume image or deriving a first two-dimensional image from the stored first voxels of the first image. The differential file of Shen et al. maps changes between images and therefore does not disclose determining first volume values relevant to visualization of a first volume image, or deriving a two-dimensional image from the relevant values (or associated voxels)

  [The Examiner respectfully disagrees. With the differential information file, the differential volume-rendering of Shen et al. uses the temporal coherence between sets of volume for efficient volume animation. Clearly, the differential information is used in rendering a volume image. Shen et al. teaches that the data of the differential file is need for the rendering process. The 3D positional data of each voxel used in the rendering is the "**volume values relevant to visualization.**" Note further, differential information file stores ("**determining**") such information ("**volume values relevant to visualization**") only needed for the rendering process.]

Conclusion

24.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to DAVID H. CHU whose telephone number is (571)272-

8079. The examiner can normally be reached on M-F 9:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Kee Tung can be reached on (571) 272-7794. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kee M Tung/
Supervisory Patent Examiner, Art Unit 2628

DHC